



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,975	07/08/2004	Chihiro Kawai	50389-052	3373

7590 02/07/2007  
McDermott Will & Emery  
600 13th Street N W  
Washington, DC 20005-3096

EXAMINER
----------

ARENA, ANDREW OWENS

ART UNIT	PAPER NUMBER
----------	--------------

2811

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/07/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/500,975

Applicant(s)

KAWAI ET AL.

Examiner

Andrew O. Arena

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-61 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-37, 46 and 47 is/are allowed.
- 6) ☒ Claim(s) 1-8, 11, 16-22, 24-28 and 38 is/are rejected.
- 7) ☒ Claim(s) 9, 10, 12-15, 23, 39-45, and 48-61 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11/06/2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date Nov 06 2006.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

#### ***Claim Objections***

Claims 7 and 8 are objected to because the recitation “and/or” causes uncertainty as to whether it is the “and” or the “or” which defines the scope of the claim. Further, “and/or” is not the proper Markush style of claiming. See MPEP § 2173.05(h).

Claim 9 is objected to because there is insufficient antecedent basis for “the insulating layer”. Claim 9 depends from claim 1, which does not define said layer. It seems claim 9 should depend from claim 8, which would remedy this objection.

#### ***Claim Rejections - 35 USC § 112***

Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

Claim 3 recites a “wavelength of 200 to 400 nm.” The specification ([0080] ln 6) purports, without examples or data, an emission wavelength of 200 nm for AlN. Evidence of record (Nature. Vol.441 pg 325) demonstrates that before 18 May 2006, the scientific community had never seen a wavelength as low as 210 nm from an LED. Applicant's description was not enabling at the time of filing (10 July 2003) for a person having ordinary skill in the art to make and/or use a device as defined by the claim and emitting a wavelength equal to or less than 210 nm. See MPEP § 2164.05(a).

***Claim Rejections - 35 USC § 102***

Claims 1-5, 11, 16, 17, 19-22, 24-27, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Kumomi (US 5,726,464).

**Re claim 1**, Kumomi discloses (Fig 1) a porous semiconductor, comprising:  
a porous substrate (one of the plural layers comprising 2; col 5 ln 3) having continuous (uninterrupted) pores; and  
a porous semiconductor layer (another of the plural layers comprising 2) having a light emitting function (luminous) that works by electroluminescence, and having continuous (uninterrupted) pores.

The preamble statement “for filtering, sterilizing, and decomposing organic matter” merely states the purpose or intended use of the invention, and has not been given patentable weight. See MPEP 2111.02(II).

Furthermore, Kumomi is capable of applicant's intended use. A material made porous by anodization (col 6 ln 40, col 10 ln 36-59) has, by definition, already had a liquid etchant filter throughout the material to form continuous pores throughout.

**Re claims 2-4**, Kumomi does not limit his porous semiconductor to any particular material (col 3 ln 40-43), therefore the disclosure of Kumomi encompasses all well-known porous semiconductors, including those which emit ultraviolet light with a wavelength of 400nm or less, particularly a wavelength in a range of 230 to 270 nm.

**Re claim 5**, Kumomi discloses the semiconductor layer has a pn junction structure (col 4 ln 48-50).

**Re claim 11**, Kumomi can be considered a filter, being capable of such use.

**Re claim 16**, Kumomi discloses the porous semiconductor layer is composed of numerous columns of semiconductor material erected on a surface of the porous substrate (the solid layer can be considered contiguous columns). The terms "columns"& "erected" must be given their broadest interpretation. See MPEP § 2111.

**Re claim 17**, Kumomi discloses the pores in the porous substrate are through-holes (inherent in anodically formed pores) perpendicular to a substrate plane (a plane can always be chosen which is perpendicular to the pores).

**Re claim 19**, Kumomi discloses a pn junction (col 4 ln 48-50) is formed in a lengthwise direction of the columns (a lengthwise direction reads on any direction).

**Re claim 20**, Kumomi discloses the columns compris[e] a base component (one end) and a pointed (in some direction) component located on the distal end side of this base component.

**Re claim 21**, Kumomi discloses an electroconductive porous film (one of the plural layers comprising 2; col 5 ln 3) is disposed as an electrode at the distal ends of the columns and on an opposite surface of the porous substrate from the surface where the columns are formed.

**Re claim 22**, Kumomi discloses an electroconductive porous film (one of the plural layers comprising 2; col 5 ln 3) is disposed as an electrode at the distal ends of the columns, and the porous substrate is composed of an electroconductive material and constitutes another electrode.

**Re claim 24**, Kumomi can be considered a filter, being capable of such use.

**Re claim 25**, Kumomi discloses the porous semiconductor layer is formed by depositing (putting) semiconductor particles having a light emitting function on a surface of the porous substrate (all matter is made of particles).

**Re claim 26**, Kumomi discloses (Fig 1) an electrode (5) for injecting current into the porous semiconductor layer.

**Re claim 27**, Kumomi discloses wherein the porous semiconductor layer is composed of a deposited layer of p-type semiconductor particles and a deposited layer of n-type semiconductor particles to form a pn junction (all matter is made of particles).

**Re claim 38**, Kumomi can be considered a filter, being capable of such use.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6, 7, & 18 are rejected under 35 USC 103(a) as being unpatentable over Kumomi as applied to claim 1 above, and further in view of Canham (US 5,914,183).

**Re claim 6**, Kumomi differs from the claimed invention only in not expressly disclosing a porosity of the semiconductor layer.

Canham discloses a porous semiconductor material and teaches that the luminescence properties of a porous semiconductor improve with increasing porosity (col 1 ln 30-31, col 2 ln 19-24, col 12 ln 65-67).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that in view of Canham, a porosity of the semiconductor layer of Kumomi is at least 30%; at least to improve luminescence.

**Re claims 7 & 18**, Kumomi differs from the claimed invention only in not expressly disclosing an average pore size.

Kumomi discloses the porous layer is about 0.9 $\mu$ m (col 11 ln 35) and that large pores are formed (col 12 ln 5-7).

It seem obvious solely on the basis of Kumomi that an average pore size of the porous substrate and/or the porous semiconductor is from 0.0003 to 100  $\mu$ m; just so the pores fit in the porous layer. However, the following evidence is also submitted.

Canham discloses that a large porosity is desirable (col 1 ln 30-31, col 2 ln 19-24, col 12 ln 65-67) and discloses pores on the order of 10  $\mu$ m (col 6 ln 15-20).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that in view of Canham, an average pore size of the porous substrate and/or the porous semiconductor of Kumomi is from 0.0003 to 100  $\mu$ m; at least for optimum pore size. See MPEP § 2144.05(II).

Claims 8 and 28 are rejected under 35 USC 103(a) as being unpatentable over Kumomi as respectively applied to claims 1 and 25 above, and further in view of Kurtz (US 6,225,647).

**Re claims 8 & 28**, Kumomi differs from the claimed invention only in not disclosing an insulating layer formed on the semiconductor layer.

Kurtz discloses a porous light-emitting semiconductor and teaches that coating the surface of the semiconductor with an insulating layer (Fig 1D: 28; col 5 ln 7) is beneficial (col 4 ln 65 – col 5 ln 1; col 6 ln 38-47) for any porous emitter (col 6 ln 56-60).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Kumomi in view of Kurtz such that the surface of the semiconductor particles is coated with an insulating layer, and therefore, that an insulating layer is formed on the front and/or back surface of the semiconductor layer; at least because doing so is beneficial.

***Allowable Subject Matter***

Claims 29-37, 46 and 47 are allowed. Claim 61 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Reasons for allowance were given in the prior office action (dated 11/06/2006).

Claims 9-10, 12-15, 23, 39-45, and 48-60 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 9 would be allowable only if rewritten to additionally overcome the above claim objection.

Allowable subject matter has been indicated because the references of record, alone or in combination, do not teach or suggest:

“the insulating layer is formed from a material having a photocatalytic function”,  
as required by claim 9;



"a surface of these crystal particles is coated with particles having a photocatalytic function", as required by claim 10;

"the porous substrate is a porous ceramic or a metal having continuous pores", as required by claims 12-15;

"a surface of the columns and/or a column-side surface of the electrode disposed at the distal ends of the columns is coated with particles having a photocatalytic function", as required by claim 23;

"a porous insulating layer" or "doped with gadolinium", as required by claim 39;

"semiconductor particles in an insulating layer" or "doped with gadolinium", as required by claims 40-45 and 48-50; and

"the porous semiconductor is made of porous silicon nitride" as required by claims 51-60.

### ***Response to Arguments***

Applicant's arguments filed 11/06/2006 have been fully considered but they are not persuasive.

Applicant's arguments regarding enablement (pg 21-23) do not address that enablement did not occur until after the filing date. See MPEP § 2164.05(a).

Applicant's arguments regarding claim 1 (pg 24-25) are not compelling. There is a porous region (Fig 1) through which liquid has already passed (col 6 ln 40, col 10 ln 36-59), which is therefore certainly capable of filtration. The claim language does not preclude "substrate" from being read onto a porous region that is adjacent to a different

Art Unit: 2811

porous region regarded as the semiconductor layer. Remaining arguments refer to features that are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See MPEP § 2145(VI).

Applicant's arguments regarding claims 2-4 are not compelling. As noted by applicant, a patent disclosure is directed to one having ordinary skill in the art (pg 21) and therefore encompasses all that is well known in that art. See MPEP § 2184. Examiner has made out a *prima facie* case that porous semiconductor light emitters are well known to emit ultraviolet, and has even made such evidence of record (Shor). Applicant has presented attorney arguments, see MPEP § 2145(I), but has not presented evidence that devices such as that of Kumomi are not known to emit in the ultraviolet range. See MPEP § 2184(III).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

Art Unit: 2811

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

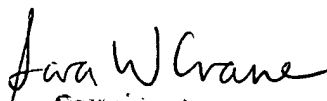
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is 571-272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on 571- 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Andrew O Arena  
3 February 2007



Sara W. Crane  
Primary Examiner